Journal Health Care and Dietetics
Volume 1 No 2 (2026): 012-020
E-ISSN: 0000-0000 (Online)
Published by Media Publikasi Indonesian Scholar
Journal homepage: https://journalmpci.com/index.php/jhcd
DOI:

Determinants of Anemia in Pregnant Women at Paccerakkang Health Center, Makassar

Irna Dewi Yuningsi[1]*, Hendrayati[1], Mustamin[1]

Correspondence email: irnadewiy@gmail.com
[1] *Dietitian Professional Study Program, Poltekkes Kemenkes Makassar, Indonesia*

ABSTRACT

Background and Objectives: Anemia during pregnancy is a public health concern that poses serious risks to both mother and fetus, including increased risk of preterm delivery and maternal mortality. This study aimed to identify the determinant factors associated with the incidence of anemia among pregnant women in the working area of Paccerakkang Health Center, Makassar City. Methods and Study Design: A cross-sectional study was conducted involving 35 pregnant women as respondents. Data were collected through a structured questionnaire and analyzed using the chi-square test. Results. Among the 35 respondents, 45.7% were found to be anemic. Bivariate analysis demonstrated statistically significant associations between anemia and both nutritional status (p = 0.035) and gestational age (p = 0.016). Conversely, no significant associations were observed between anemia and maternal age (p = 0.187), educational level (p = 0.646), occupation (p = 0.677), presence of infectious diseases (p = 1.000), birth spacing (p = 1.000), antenatal care (ANC) visits (p = 0.508), adherence to iron and folic acid supplementation (p = 0.677), knowledge about anemia (p = 0.379), protein intake (p = 0.877), vitamin C intake (p = 0.830), or dietary iron intake. Conclusion. We conclude that the determinant factors associated with the incidence of anemia among pregnant women at Paccerakkang Health Center were nutritional status and gestational age.

ARTICLE INFO

CASE REPORTS
Submitted: July 25, 2025
Accepted: August 28, 2025
Published: August 31, 2026
Keywords:
Anemia, Maternal Nutrition

Key Messages:

- Nutritional status (CED) and gestational age were significantly associated with anemia (p = 0.035 and p = 0.016, respectively), indicating the need for trimester-specific nutritional support.
- Other sociodemographic and behavioral factors, such as maternal age, education, occupation, ANC visits, adherence to iron supplementation, and dietary intake (protein, vitamin C, iron), showed no significant association with anemia

INTRODUCTION

Maternal health is a crucial aspect of a woman's life cycle. During pregnancy, women are at increased risk of experiencing various complications that may affect both maternal and fetal health[1]. One of the most common nutritional problems experienced by pregnant women is anemia. According to the Indonesian Basic Health Research (2018), the prevalence of anemia among pregnant women in Indonesia was 48.9%, increased from 37.1% in 2013[2]. Among pregnant women, anemia may manifest with symptoms such as dyspnea, syncope, fatigue, weakness, tachycardia, and palpitations. It may also impair immune function and increase the risk of hemorrhage both antepartum and postpartum. In the fetus, maternal anemia may lead to intrauterine hypoxia and fetal growth restriction (FGR)[3].

As a physiological process, pregnancy requires careful planning that considers multiple factors potentially affecting the health of both the mother and the fetus[4]. A literature review conducted by Azmi and Puspitasari (2022) identified 19 factors that are significantly associated with the incidence of anemia in pregnant women. These factors span biological, socioeconomic, behavioral, and environmental domains. Specifically, they include maternal age, ethnicity, education level,

parity, adherence to iron and folic acid supplementation, economic status, nutritional status, pregnancy trimester, gestational age, frequency of antenatal care (ANC), place of residence, and household income. Additionally, family size, food security, dietary patterns, coexisting clinical conditions, parasitic infections, non-use of contraception, and body mass index were also found to contribute to anemia risk. These findings underscore that anemia during pregnancy is a multifactorial condition requiring a comprehensive prevention and intervention approach[5].

As a primary healthcare facility in Makassar City, Paccerakkang Health Center plays an essential role in the early detection and management of anemia risk factors. This study, therefore, aims to examine the determinants of anemia among pregnant women in Paccerakkang Health Center, with the goal of informing more targeted and effective intervention strategies.

METHOD

The design of this study was cross-sectional, conducted in July 2025 at the Paccerakkang Health Center in Makassar City. The study population consisted of all pregnant women residing within the service area of the Paccerakkang Health Center. Participants were selected using an accidental sampling technique, including all pregnant women who attended their initial antenatal visit during the study period. There are 35 individuals participated in this study.

Procedure

The data for this study consisted of both primary and secondary sources. Primary data included maternal sociodemographic characteristics, anthropometric measurements, knowledge regarding anemia, and dietary intake. Sociodemographic variables comprised maternal age, education level, occupation, gestational age, history of infectious diseases, interpregnancy interval, antenatal care (ANC) visit history, and adherence to iron and folic acid (IFA) supplementation. Knowledge about anemia was assessed using a validated questionnaire consisting of 25 true-or-false statements. Anthropometric data were obtained through direct measurement of mid-upper arm circumference (MUAC) by the researcher using a standardized measuring tape. Dietary intake was assessed using a Food Frequency Questionnaire (FFQ) and a 24-hour dietary recall. Hemoglobin concentrations were obtained from secondary data recorded by the laboratory unit at the Paccerakkang Public Health Center. Anemia was defined according to World Health Organization (WHO) criteria as a hemoglobin level <11.0 g/dL.

Data Analysis

The data collected through questionnaires were coded and entered into SPSS version 25 for statistical analysis. The analysis included both univariate and bivariate approaches. Univariate analysis was used to describe respondent characteristics, including the dependent variable (anemia status) and independent variables such as maternal age, occupation, education level, nutritional status (measured by MUAC), history of infectious diseases, birth spacing, antenatal care (ANC) visits, adherence to iron and folic acid (IFA) supplementation, knowledge about anemia, and nutrient intake (assessed through FFQ and 24-hour recall). Bivariate analysis was conducted using the chi-square test to assess associations between independent variables and anemia status. In addition, nutrient intake data were analyzed using NutriSurvey software.

Research Ethics

This research obtained ethical approval from the Health Research Ethics Commission, Makassar Health Polytechnic on July 11, 2025, with approval number: 1459/M/KEPK-PTKMS/VII/2025.

RESULTS

Subject Characteristics

Among the 35 pregnant women who met the inclusion criteria, 16 participants (45.7%) were classified as anemic based on hemoglobin levels, while 19 participants (54.3%) were not, as shown in Table 1.

Table 1. Distribution of Characteristics and Anemia Status in Pregnant Women at Paccerakkang Health Center

Category	Frequency (n)	%
Anemic	16	45.7
Non anemic	19	54.3
Total	35	100

Participant characteristics are summarized in Table 2. Most participants were between 20 and 35 years old (82.9%), had completed senior high school or an equivalent level of education (42.9%), and were unemployed (80%). The majority had normal nutritional status (not undernourished) (88.6%) and no history of infectious diseases (88.6%). More than half of the participants were in their first trimester (51.4%) and had a birth interval of more than two years (82.9%). Furthermore, 62.9% were attending their first antenatal care (ANC) visit during the current pregnancy. A high proportion (80%) reported non-adherence to iron and folic acid (IFA) supplementation, while 82.9% demonstrated a good level of knowledge regarding anemia. Based on dietary assessment, 51.4% of participants had inadequate protein intake, 54.3% had inadequate vitamin C intake, and all participants (100%) had inadequate iron intake.

Table 2. Frequency Distribution of Characteristic Respondents

Characteristic	Frequency (n)	%
Age		
20-35 years	29	82.9
<20 or >35 years	6	17.1
Education Level		
Elementary or equivalent	5	14.3
Junior high school	3	8.6
Senior high school	15	42.9
Higher education	12	34.3
Occupation		
Employed	7	20
Unemployed	28	80
Nutritional Status		
CED	4	11.4
Not CED	31	88.6
History of Infectious Disease		
Yes	3	8.6
No	32	91.4
Gestational Age		
First trimester	18	51.4
Second trimester	11	31.4
Third trimester	6	17.1
Birth interval		
< 2 years	6	17.1
≥ 2 years	29	82.9
ANC		
1 visit	22	62.9
>1 visit	13	37.1
Adherence to (IFA) Supplementation		
Adherent	7	20
Non-adherent	28	80
Knowledge		
Good	29	82.9
Poor	6	17.1
Protein Intake		
Adequate	17	48.6
Inadequate	18	51.4
Vitamin C intake		
Adequate	16	45.7
Inadequate	19	54.3
Iron Intake (Fe)		
Adequate	0	0
Inadequate	35	100

DISCUSSIONS

Maternal age and Anemia Among Pregnant Women

The analysis revealed that among 29 pregnant women aged 20–35 years, 15 (93.8%) were anemic and 14 (73.7%) were non-anemic. In comparison, among six women aged <20 or >35 years, only one (6.2%) was anemic and five (26.3%) were non-anemic. Statistical analysis showed no significant association between maternal age and anemia status at Paccerakkang Health Center (p =

0.187). These findings are consistent with a study by Yuvita et al. (2024), which also reported no significant association between maternal age and anemia occurrence among pregnant women at Pangkoh Health Center (p = 0.072). The authors suggested that maternal age may not be a primary determinant of anemia and that other contributing factors might be involved. However, women in the high-risk age categories (<20 or >35 years) appeared to have a 5.4-fold greater risk of developing anemia compared to those aged 20–35 years[6].

Table 3. Association Between Various Variables and the Status Anemia Among Pregnant Women at Paccerakkang Health Center

Variabel	Status				p-value
	Anemic		Non Anemic		
	n	%	n	%	
Age					
20-35 years	15	93.8	14	73.7	0,187
<20 or >35 years	1	6.2	5	26.3	
Education Level					
Elementary or equivalent	2	12.5	3	15.8	0.646
Junior high school	1	6.3	2	10.5	
Senior high school	9	56.3	6	31.6	
Higher education	4	25	8	42.1	
Occupation					
Employed	4	25	3	15.8	0.677
Unemployed	12	75	16	84.2	
Nutritional Status					
CED	4	25	0	0.0	0.035
Not CED	12	75	19	100	
History of Infectious Disease					
Yes	1	6.2	2	10.5	1.000
No	15	93.8	17	89.5	
Gestational Age					
First trimester	5	31.3	13	68.4	0.016
Second trimester	6	37.5	5	26.3	
Third trimester	5	31.3	1	5.3	
Birth Interval					
< 2 years	3	18.8	3	81.8	1.000
≥ 2 years	13	81.3	16	82.9	
ANC					
1 visit	11	68.8	11	57.9	0.508
>1 visit	5	3.2	8	42.1	
Adherence to (IFA) Supplementation					
Adherent	4	25	3	15.8	0677
Non-adherent	12	75	16	84.2	
Knowledge					
Good	12	75	17	89.5	0.379
Poor	4	25	2	10.5	
Protein Intake					
Adequate	8	50	9	47.4	0.877
Inadequate	8	50	10	52.6	
Vitamin C intake					
Adequate	7	43.8	9	47.4	0.830
Inadequate	9	56.3	10	52.6	
Iron Intake (Fe)					
Adequate	0	0	0	0	Not analyzed
Inadequate	16	100	19	100	

Riyani et al. (2020) proposed that pregnant women within the non-risk age range are less likely to develop anemia, assuming sufficient nutritional intake is maintained to stabilize hemoglobin levels. Biologically, women aged 20–35 years typically have fully matured reproductive organs and are physically prepared for pregnancy and childbirth. Nonetheless, psychological maturity at this age may still be developing. Conversely, pregnant women under the age of 20 are often still in adolescence, with limited independence and emotional readiness. Women over the age of 35 may benefit from prior pregnancy experience; however, physiological aging can lead to a decline in various bodily functions, including the production of red blood cells[7]. These age-related physiological differences may help explain the increased risk of anemia observed in both younger and older pregnant women. Further investigation with a larger sample size and multivariate analysis is warranted to clarify this potential association.

Educational Level and Anemia in Pregnant Women

In this study, educational level was defined as the highest formal education completed by the pregnant women. The findings indicated that the majority of those who experienced anemia had a senior high school education, accounting for 56.3% (n = 9). Statistical analysis revealed no significant association between educational attainment and the occurrence of anemia during pregnancy (p = 0.646). This result is consistent with the study conducted by Bachtiar et al. (2023), which reported no significant correlation between education and anemia (p = 0.258)[8], as well as with Siregar et al. (2023), who found no association between maternal education and anemia prevalence in their study population (p = 0.509)[9].

While higher education is generally associated with improved capacity to acquire and process health-related information, formal education alone may not ensure specific knowledge about anemia unless the education is in the health sciences. Moreover, access to information through mass media, such as television advertisements or online platforms, and the ability to self-medicate through pharmacies, may reduce the educational gap in anemia awareness[9,10]. Therefore, education should not be regarded as the sole determinant of anemia prevention knowledge and behavior among pregnant women.

Maternal Occupation with Anemia in Pregnant Women

In this study, 25% of working pregnant women were anemic, compared to 75% of non-working pregnant women. However, statistical analysis revealed no significant association between maternal employment status and anemia (p = 0.677). This finding is consistent with previous studies by Isnaini et al. and Sari, which also reported no significant correlation between employment and anemia status during pregnancy. Although non-working mothers often classified as housewives do not engage in formal employment, they may still experience a substantial non-formal occupational workload, particularly when caring for multiple children[11,12].

In contrast, Kejela et al. found a significantly increased risk of anemia among daily laborers. This discrepancy may reflect the heterogeneity of occupational types, where physically demanding labor, rather than employment status per se, is a more direct contributor to anemia. Furthermore, employment status alone is not the primary determinant of maternal anemia. Dietary intake, access to health information, and adherence to antenatal care (ANC) visits may have a greater influence on hemoglobin levels[13].

Nutritional Status (Chronic Energy Deficiency) and Anemia Among Pregnant Women

The findings revealed that 4 pregnant women (25%) with chronic energy deficiency (CED) experienced anemia. Additionally, 12 women (75%) without CED were also anemic, while 19 women (100%) without CED did not experience anemia. Statistical testing showed a p-value of 0.035, indicating a significant association between nutritional status and the incidence of anemia in pregnant women. This result is consistent with the study conducted by Musfida and Hateriah (2023), which reported a significant association between nutritional status and anemia among pregnant women at Sebatung Health Center (p = 0.032)[14]. A similar finding was reported by Bria and Rohmah (2023), who observed a significant relationship between nutritional status and anemia among pregnant women at Sri Lestari Maternity Clinic in Yogyakarta (p = 0.046)[15].

Hemoglobin reduction during pregnancy is caused by increased nutritional requirements and physiological changes in blood composition. When a pregnant woman has inadequate nutritional intake, it may lead to anemia. Improving maternal nutritional status, particularly among women with CED or those at risk, requires adequate nutrient intake adjusted to the specific physiological demands of each trimester[14]. Furthermore, future studies may benefit from a more detailed classification of nutritional status to better understand its association with anemia.

Infectious Diseases and Anemia Among Pregnant Women

The study found that one pregnant woman (6.2%) who had an infectious disease developed anemia, while 15 women (93.8%) without infectious diseases also developed anemia. Statistical analysis yielded a p-value of 1.00, indicating no significant association between the presence of infectious diseases and the incidence of anemia. This finding is consistent with the study by Marisi and Istianah (2021), which reported no significant relationship between infectious diseases and anemia among pregnant women at the Kebun Jeruk Primary Health Center (p = 0.924)[16].

In contrast, a study conducted by Yosef in Ethiopia identified a significant association between hookworm infection and anemia during pregnancy. Pregnant women infected with hookworms were 2.7 times more likely to develop anemia compared to those who were not infected[17]. For a more comprehensive understanding, future research should identify and categorize specific types of infections and examine their individual effects on hemoglobin levels, as different pathogens may influence anemia risk through distinct biological mechanisms.

Gestational Age and Anemia Among Pregnant Women

Analysis of the gestational age variable showed a statistically significant association with anemia (p = 0.016), with the highest prevalence observed during the second trimester. This finding aligns with the results of Tendean et al. (2025), who reported a significant relationship between gestational age and anemia among pregnant women at the Kakaskasen Health Center in North Tomohon District (p = 0.021). Similarly, a study conducted in Ghana involving 400 pregnant women demonstrated an increasing prevalence of anemia with advancing gestational age. In that study, women in the later trimesters were four times more likely to develop anemia compared to those in the early stages of pregnancy[18,19].

The association between gestational age and anemia can be attributed to the increased iron demands during pregnancy. Anemia is more frequently observed during the second trimester, which coincides with the period of maximum

plasma volume expansion. This physiological change leads to a dilutional decrease in hemoglobin and hematocrit levels, typically reaching their lowest point at the end of the second trimester before rising again in the third trimester[20]. To better characterize this trend, future research may consider serial hemoglobin measurements throughout pregnancy to track dynamic changes across trimesters.

Interpregnancy Interval and Anemia Among Pregnant Women

The interpregnancy interval variable yielded a p-value of 1.00, indicating no statistically significant association with anemia. In this study, the majority of anemic pregnant women (81.3%; n = 13) had an interpregnancy interval of more than two years. This finding contrasts with the results of Effendi et al. (2024), who reported a significant association between short interpregnancy intervals and anemia during the third trimester at the Purwosari Health Center in Pasuruan District ($p = 0.013$)[21].

Oktaviana et al. (2022) suggested that short intervals between pregnancies may increase the risk of anemia due to inadequate maternal nutritional recovery and depleted iron stores following the previous pregnancy. In such cases, the risk of anemia is heightened, particularly when uterine involution is incomplete. Similarly, Yosef reported that women with short birth intervals were seven times more likely to develop anemia compared to those with optimal spacing. These findings are further supported by a study conducted in Harar, Ethiopia, which demonstrated that short interpregnancy intervals significantly increased the risk of maternal health complications, including anemia[17,22,23].

To strengthen the interpretation of this association, future studies are advised to control for potential confounding variables such as maternal age, parity, and socioeconomic status, which may influence both interpregnancy interval and anemia status.

Antenatal Care (ANC) Visits and Anemia Among Pregnant Women

The analysis revealed a p-value of 0.508, indicating no statistically significant association between the number of antenatal care (ANC) visits and the incidence of anemia. Most participants in this study were in their first trimester and had only recently initiated ANC visits, which may have contributed to the absence of a significant association. This finding aligns with the results of Malaka et al. (2023), who also reported no significant association between ANC attendance and anemia among pregnant women at the Tapa Health Center ($p = 1.00$)[24].

In 2016, the World Health Organization (WHO) recommended a minimum of eight ANC visits to promote a positive pregnancy experience and reduce maternal and neonatal morbidity and mortality. In Indonesia, national guidelines recommend at least six ANC visits, including a minimum of two physician-led visits in the first trimester and one in the third trimester for risk screening. Completion of the recommended ANC schedule has been associated with a reduced risk of anemia[25,26]. To strengthen the interpretation of future research, it is recommended to distinguish between the number and quality of ANC services received, as both dimensions may influence maternal health outcomes.

Adherence to Iron and Folic Acid (IFA) Supplementation and Anemia Among Pregnant Women

Adherence to iron and folic acid (IFA) supplementation showed a p-value of 0.677, indicating no statistically significant association with anemia in this study. A considerable proportion of participants were in their first trimester and had not yet initiated IFA supplementation. Others reported common barriers such as nausea and limited awareness regarding the importance of completing the recommended supplementation regimen.

These findings differ from those reported by Nurmasari and Sumarmi, who found a significant association between IFA adherence and anemia among third-trimester pregnant women in Maron District, Probolinggo ($p = 0.001$, $r = 0.528$). Their study indicated that women with poor adherence were 3.46 times more likely to develop anemia than those who were compliant. Iron supplementation plays a critical role during pregnancy by supporting erythropoiesis, enhancing oxygen transport, facilitating cellular metabolism, and maintaining maternal energy levels. Inadequate iron intake leads to depleted iron stores, impaired red blood cell production, and reduced oxygen delivery, thereby increasing the risk of anemia[26]. Future studies are recommended to apply validated tools to assess adherence and to further explore the timing, dosage, and duration of IFA supplementation in relation to anemia outcomes.

Knowledge and Anemia Among Pregnant Women

In this study, maternal knowledge was defined as the pregnant women's awareness and understanding of anemia, including its causes, symptoms, prevention, and treatment. The analysis revealed a p-value of 0.379, indicating no statistically significant association between knowledge and anemia status. Among the anemic participants, 75% demonstrated good knowledge, while 25% had poor knowledge.

This finding contrasts with the study by Teja et al. (2021), which reported a significant association between knowledge and anemia among pregnant women at South Denpasar Health Center I ($p = 0.001$). Conversely, Souganidis et al. found no significant relationship between maternal knowledge and anemia status. However, in rural populations, increased maternal knowledge was significantly associated with a reduced risk of childhood anemia (OR = 0.93, $p = 0.01$), a pattern not observed in urban settings. Maternal knowledge was also associated with improved health behaviors, including adherence to iron-folic acid supplementation and the provision of fortified milk to children[27,28]. To improve reproducibility and facilitate interpretation, future studies should clearly specify the instruments used to measure knowledge, including questionnaire design, scoring methods, and validation procedures.

Protein Intake and Anemia Among Pregnant Women

The analysis revealed a p-value of 0.877, indicating that the association between protein intake and anemia was not statistically significant. Despite the lack of significance in this study, protein plays a critical physiological role in hemoglobin synthesis and iron transport. According to the Indonesian Dietary Reference Intakes (AKG 2019), the protein requirements for women aged 19–49 years are 60 g/day, with additional needs during pregnancy: 1 g/day in the first trimester, 10 g/day in the second, and 30 g/day in the third trimester[29].

This finding differs from previous studies. Apriyanti et al. (2021) reported a significant association between protein intake and anemia among pregnant women attending the Bakau Serip and Sakura Indah Health Posts in Batam City (p = 0.031). Similarly, Tarigan (2021) observed a significant relationship at the Petumbukan Health Center (p = 0.001)[30,31]. These discrepancies may be attributed to differences in measurement methods, gestational age, or dietary patterns. Future research should utilize validated dietary assessment tools and account for the bioavailability of protein sources to enhance accuracy and comparability.

Vitamin C Intake and Anemia Among Pregnant Women

Vitamin C plays a crucial role in enhancing the absorption of non-heme iron, thereby supporting hemoglobin synthesis and preventing anemia. The recommended dietary allowance (RDA) for pregnant women aged 19–49 is 75 mg/day, with an additional 10 mg/day required during the second and third trimesters[29]. Common sources include oranges, papayas, and tomatoes, which, when consumed alongside iron-rich foods, may enhance iron bioavailability.

In this study, the analysis yielded a p-value of 0.830, indicating no statistically significant association between vitamin C intake and anemia. The mean intake among participants was 33.46 mg/day, which falls below recommended levels and may be attributed to low consumption of fruits and vegetables. These findings are consistent with those of Putri et al. (2019), who also reported no significant association between vitamin C intake and anemia among pregnant women in Jatinangor (p = 0.82). Although the association was not statistically significant, ensuring adequate vitamin C intake remains important in anemia prevention strategies. Nutrition programs should emphasize the co-consumption of iron and vitamin C-rich foods to improve iron absorption and support maternal health outcomes[32-34].

Iron Intake and Anemia Among Pregnant Women

Given that all participants exhibited inadequate dietary iron intake (mean: 5.9 mg/day), bivariate analysis could not be conducted due to the lack of variability in the data. This inadequate intake was largely attributed to low consumption of animal-based protein sources such as beef, chicken, liver, and fish. In comparison, the Indonesian Dietary Reference Intakes recommend 18 mg/day of iron for women aged 19–49, with an additional 9 mg/day during the second and third trimesters[29]

A systematic review of Indonesian pregnant women revealed that iron intake typically falls below 60% of recommended levels, highlighting chronic nutritional deficiencies and the urgent need for targeted interventions. Tarihan et al. (2017) also reported a significant association between low iron intake and anemia among second- and third-trimester pregnant women in Semarang (p = 0.001). Poor knowledge and suboptimal dietary practices regarding iron absorption contribute further to this deficiency[35-37]. Future interventions should prioritize (1) fortification of staple foods with bioavailable iron, (2) nutrition education focused on iron absorption enhancers and inhibitors, and (3) improved access to affordable and tolerable iron supplements.

CONCLUSION

Determinant factors associated with the incidence of anemia among pregnant women at Paccerakkang Health Center were nutritional status (p = 0.035) and gestational age (p = 0.016).

Declaration of Conflicting Interests: The researcher admits that there is no conflict of interest in this study.

REFERENCE

1. Triharini M. Upaya bersama dalam pencegahan anemia kehamilan. Pediomaternal Nurs J. 2019;5(2). doi:10.20473/pmnj.v5i2.21220.
2. Widiastini PMF, Purnami LA, Triguno Y. The relationship between the level of knowledge of pregnant women about anemia in pregnancy and compliance with the consumption of iron tablet supplements at the Penebel I Health Center in 2022. Prima Wiyata Health. 2023;4(2):47–56. Available from: http://e-journal.shj.ac.id/ojs/index.php/PWH/index
3. Sastri N. Terapi komplementer pada ibu hamil dengan anemia: a literature review. Babul Ilmi: Jurnal Ilmiah Multi Science Kesehatan. 2025;17(1):262–80. doi:10.36729/bi.v17i1.
4. Sari SA, Fitri NL, Dewi NR. Hubungan usia dengan kejadian anemia pada ibu hamil di Kota Metro. Jurnal Wacana Kesehatan. 2021;6(1):23–6. doi:10.52822/jwk.v6i1.169.
5. Azmi U, Puspitasari Y. Risk factors of anemia in pregnant women: a literature review. Journal for Quality in Public Health. 2022;6(1):244–56. doi:10.30994/jqph.v6i1.428.
6. Yuvita L, Ariani M, Latifah. Hubungan umur dan paritas dengan kejadian anemia pada ibu hamil. Jurnal Keperawatan Jiwa. 2024;12(6):869–82. Available from: https://jurnal.unimus.ac.id/index.php/JKJ/article/view/16022
7. Riyani R, Marianna S, Hijriyati Y. Hubungan antara usia dan paritas dengan kejadian anemia pada ibu hamil. Binawan Student Journal. 2020;2(1):178–84. doi:10.54771/bsj.v2i1.105.

8. Bachtiar H, Haruna N, Delima AA. Hubungan tingkat pendidikan dengan kejadian anemia pada ibu hamil di Pampang Kota Makassar. Jurnal Midwifery. 2023;5(1):47–52. doi:10.24252/jmw.v5i1.35510.
9. Siregar N, Nauli HA, Nasution AS. Hubungan kejadian anemia pada ibu hamil di wilayah kerja Puskesmas Bogor Utara. PROMOOR Jurnal Mahasiswa Kesehatan Masyarakat. 2023;6(4):392–401. doi:10.32832/pro.v6i4.272.
10. Maywati S, Novianti S. Kajian karakteristik individu sebagai faktor risiko kejadian anemia pada ibu hamil: studi di Puskesmas Karanganyar Kota Tasikmalaya. Jurnal Kesehatan komunitas Indonesia. 2020;16(2):202–8. Available from: https://jurnal.unsil.ac.id/index.php/jkki/article/view/2578/1574
11. Isnaini YS, Yuliaprida R, Pihahey P. Hubungan usia, paritas, dan pekerjaan terhadap kejadian anemia pada ibu hamil. Nursing Arts. 2021;15(2):65–74. Available from: https://jurnal.poltekkes-sorong.id/index.php/NA/article/view/39
12. Sari R. Faktor yang berhubungan dengan kejadian anemia pada ibu hamil. Jurnal Kesehatan Luwu Raya. 2021;7(2):148–55. Available from: http://www.jurnalstikesluwuraya.ac.id/index.php/eq/article/view/51
13. Kejela G, Wakgari A, Tesfaye T, Turi E, Adugna M, Alemu N, et al. Prevalence of anemia and its associated factors among pregnant women attending antenatal care follow up at Wollega University Referral Hospital, Western Ethiopia. Contracept Reprod Med. 2020;5:26. doi:10.1186/s40834-020-00130-9.
14. Musfida NH, Hateriah S. The relationship between nutritional status and the incidence of anemia in pregnant women at Sebatung Health Center. Midwifery Complement Care. 2023;2(2):1–6. Available from: https://ejurnal.unism.ac.id/index.php/MaCC/article/view/326
15. Bria GE, Rohmah FN. Hubungan status gizi dan usia dengan kejadian anemia pada ibu hamil. Kosala Jurnala Ilmu Kesehatan. 2023;11(1):23–9. doi:10.37831/kjik.v11i1.259.
16. Marisi T, Istianah I. Faktor-faktor yang mempengaruhi kejadian anemia pada ibu hamil di Puskesmas Kecamatan Kebon Jeruk. Seminar Nasional Kesehatan Masyarakat UPNVJ. 2021;2(1):32–46. Available from: https://conference.upnvj.ac.id/index.php/semnashmkm2020/article/view/1976
17. Yosef T, Gizachew A, Fetene G, Girma D, Setegn M, Tesfaw A, et al. Infectious and obstetric determinants of anemia among pregnant women in Southwest Ethiopia. Front Glob Womens Health. 2024;5:1421884. doi:10.3389/fgwh.2024.1421884.
18. Tendean AF, Ering CN, Makasudede S. Hubungan usia ibu hamil, usia kehamilan, dan kepatuhan mengonsumsi tablet Fe dengan kejadian anemia pada ibu hamil. Nutrix Journal. 2025;9(1):135–44. doi:10.37771/nj.v9i1.1257.
19. Wemakor A. Prevalence and determinants of anaemia in pregnant women receiving antenatal care at a tertiary referral hospital in Northern Ghana. BMC Pregnancy Childbirth. 2019;19(1):1–11. doi:10.1186/s12884-019-2644-5.
20. Ayensu J, Annan R, Lutterodt H, Edusei A, Peng LS. Prevalence of anaemia and low intake of dietary nutrients in pregnant women living in rural and urban areas in the Ashanti region of Ghana. PLoS One. 2020;15(1):e0226026. doi:10.1371/journal.pone.0226026.
21. Efendi WA, Sahadewa S, Tjandra L. Hubungan paritas dan jarak kehamilan dengan kejadian anemia pada ibu hamil trimester III di Puskesmas Purwosari Kabupaten Pasuruan. Journal of Mandalika Literature. 2024;5(3):330–7. doi:10.36312/jml.v5i3.3362.
22. Oktaviana P, Yanuarini TA, Asiyah S. Faktor-faktor yang berhubungan dengan kejadian anemia dalam kehamilan: literature review. Al-Insyirah Midwifery. 2022;11(1):1–12. doi:10.35328/kebidanan.v11i1.2100.
23. Abdu S, Ali T, Debella A, Assefa N, Teji Roba K. Magnitude and factors associated with anemia among pregnant women admitted to labor ward of Hiwot Fana Specialized University Hospital, Eastern Ethiopia. SAGE Open Med. 2021;9:20503121211047389. doi:10.1177/20503121211047389.
24. Malaka NMA, Irwan, Ahmad ZF. Faktor yang berhubungan dengan kejadian anemia pada ibu hamil di wilayah kerja Puskesmas Tapa. Journal Health & Science: Gorontalo Journal Health and Science Community. 2023;7(1):143–52. Available from: https://ejurnal.ung.ac.id/index.php/gojhes/index
25. Andarwulan S, Setiawandari, Rihardini T, Silichatin, Waroh YK. Edukasi kesehatan tentang pemeriksaan antenatal care berbasis komunitas. Jurnal Pengabdi Masyarakat. 2024;4(6):398–403. doi:10.59818/jpm.v4i6.998.
26. Nurmasari V, Sumarmi S. Hubungan keteraturan kunjungan antenatal care dan kepatuhan konsumsi tablet Fe dengan kejadian anemia pada ibu hamil trimester III di Kecamatan Maron Probolinggo. Amerta Nutr. 2019;3(1):46–51. doi:10.20473/amnt.v3i1.2019.46-51.
27. Teja NAY, Mastryagung GAD, Pangruating Diyu INA. Hubungan pengetahuan dan paritas dengan anemia pada ibu hamil. Menara Medika JMM. 2021;3(2):143–7. doi:10.31869/mm.v3i2.2451.
28. Souganidis ES, Sun K, de Pee S, Kraemer K, Rah JH, Moench-Pfanner R, et al. Relationship of maternal knowledge of anemia with maternal and child anemia and health-related behaviors targeted at anemia among families in Indonesia. Matern Child Health J. 2012;16(9):1913–25. doi:10.1007/s10995-011-0938-y.
29. Kementerian Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan RI Nomor 28 Tahun 2019 tentang Angka Kecukupan Gizi yang Dianjurkan untuk Masyarakat Indonesia. Jakarta: Kementerian Kesehatan RI; 2019.
30. Apriyanti NP, Pratiwi S, Anggraini CD. Hubungan asupan protein dengan kejadian anemia pada ibu hamil di Posyandu Bakau Serip dan Sakura Indah Puskesmas Sambau Kota Batam. Vitalitas Medis: Jurnal Kesehatan dan Kedokteran. 2025;2(1):215–21. doi:10.62383/vimed.v2i1.1301.
31. Tarigan N, Sitompul L, Zahra S. Asupan energi, protein, zat besi, asam folat, dan status anemia ibu hamil di wilayah kerja Puskesmas Petumbukan. Wahana Inovasi. 2021;10(1):117–27. Available from: https://jurnal.uisu.ac.id/index.php/wahana/article/view/4325
32. Putri RN, Nirmala SA, Aprillani IK, Judistiani TD, Wijaya M. Hubungan antara karakteristik ibu, kecukupan asupan zat besi, asam folat dan vitamin C dengan status anemia pada ibu hamil di Kecamatan Jatinangor. Jurnal Kesehatan

Vokasional. 2019;4(4):183–9. doi:10.22146/jkesvo.44202.
33. Skolmowska D, Głąbska D, Kołota A, Guzek D. Effectiveness of dietary interventions to treat iron-deficiency anemia in women: a systematic review of randomized controlled trials. Nutrients. 2022;14(13):2724. doi:10.3390/nu14132724.
34. Rieny EG, Nugraheni SA, Kartini A. Peran kalsium dan vitamin C dalam absorpsi zat besi dan kaitannya dengan kadar hemoglobin ibu hamil: sebuah tinjauan sistematis. Media Kesehatan Masyarakat Indonesia. 2021;20(6):423–32. doi:10.14710/mkmi.20.6.423-432.
35. Agustina R, Rianda D, Lasepa W, Birahmatika FS, Stajic V, Mufida R. Nutrient intakes of pregnant and lactating women in Indonesia and Malaysia: systematic review and meta-analysis. Front Nutr. 2023;10:1030343. doi:10.3389/fnut.2023.1030343.
36. Tarihan R, Mulyasari I, Pontang GS. Hubungan asupan protein, zat besi dan vitamin C dengan anemia pada ibu hamil trimester II dan III di Desa Gondoriyo Kecamatan Bergas Kabupaten Semarang. Jurnal Gizi Kesehatan. 2017;9(21):87–97. Available from: https://jurnalgizi.unw.ac.id/index.php/JGK/article/view/192
37. Syarif AL, Ansariadi A, Wahiduddin W, Wijaya E, Amiruddin R, Citrakesumasari C, Ishak H. Awareness and practices in preventing maternal iron deficiency among pregnant women living in urban slum areas in Makassar City, Indonesia. J Educ Health Promot. 2024;12:452. doi:10.4103/jehp.jehp_551_23.